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ABSTRACT

This paper deals with a significant challenge in education today: the challenge to teach life long learning and critical thinking skills in Web-based environments. This is a challenge for two reasons. First, business and government are pressuring educational institutions to prepare employees who can think critically, solve a range of problems, move easily from one task to another, work in team situations, and continuously enhance their knowledge and skills. Second, consumers (i.e., students) desire more distant learning strategies. Most strategies that develop these skills emphasize small group work, collaboration, and teacher/group interactions. One approach to this challenge is to apply the Rich Environments for Active Learning (REAL) model to Web-based learning environments. REALs are interactive, student-centered learning environments that rely on intentional learning, authentic contexts, generative learning activities, collaboration, and reflection to address the learning of content and lifelong learning skills. (Contains 35 references.) (Author)

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Applying the REAL Model to Web-based Instruction: An Overview

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Abstract: This article deals with a significant challenge in education today: the challenge to teach life long learning and critical thinking skills in web-based environments. This is a challenge for two reasons. First, business and government are pressuring educational institutions to prepare employees who can think critically, solve a range of problems, move easily from one task to another, work in team situations, and continuously enhance their knowledge and skills. Second, consumers (i.e., students) desire more distant learning strategies. Most strategies that develop these skills emphasize small group work, collaboration, and teacher/group interactions. One approach to this challenge is to apply the Rich Environments for Active Learning (REAL) model to web-based learning environments. REALs are interactive, student-centered learning environments that rely on intentional learning, authentic contexts, generative learning activities, collaboration, and reflection to address the learning of content and life long learning skills.

The Collision of Two Educational Goals

Goal #1: Preparing People for an Ever-changing World

Changing global economic circumstances and increasingly complex societal needs place greater and greater pressure on education systems to develop learners who can apply knowledge and skills in new domains and situations. Both public and private institutions expect and demand employees who can think critically and solve a range of problems, move easily from one task to another, work efficiently and effectively in team situations, and constantly adjust and enhance their knowledge and skills to meet emerging needs; yet, these institutions claim that those people are difficult to find.

This isn't too surprising. Conventional instruction often utilizes simplified and decontextualized examples and problems. This leads to inert knowledge (Whitehead, 1929) – knowledge that cannot be transferred to real problems and situations. Learners are not asked to take responsibility for their own learning – they do not set learning goals, ask questions to direct learning activities, assess their learning strategies and approaches, or reflect on what they have learned. This lack of focus on metacognitive and self-directed learning skills interferes with their ability to transfer their knowledge and skills to future needs. Therefore, to meet the goal of "preparing people for an ever-changing world", instructional programs need to apply methods that focus on the development of higher-order learning skills including critical thinking, problem solving, research, and life long learning.

Goal #2: Learning at a Distance on Demand

The learning audience shapes the second goal — the demand for more distance education opportunities. Generally, most definitions of *distance education* include the concept of time- and space-independent teaching and learning. This includes the use of information and communications technologies, interactive video, and computer networks to enable asynchronous and synchronous learner-to-facilitator, learner-to-learner, and learner-to-content interaction. Distance learning alternatives help learners deal with a number of the personal constraints, obstacles, and needs:

- People live in remote geographic areas far from educational institutions.
- Local educational institutions may have a limited number of program options from which to choose.
- People have work schedules that conflict with campus-bound course schedules. This includes people who work shifts, travel frequently on business, work long hours, and are in the armed forces.

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- People have personal and family commitments that conflict with campus-bound course schedules including children at home and aging parents.
- After a long day at work, people don't want to battle traffic or parking to get to a campus on time (and encountering the stress caused by trying to is not the best way to start a learning activity).
- Some learners may simply prefer a distance format over a face-to-face format because of their learning styles and preferences (e.g., more comfortable sharing ideas asynchronously).

Coming to Terms with These Goals

The tension created when these two goals collide is an instructional design one: On the one hand, how do you help people learn in a manner that enables them to transfer their skills and knowledge to a wide variety of situations; and on the other hand, how do you address the learning audience's expectation for learning experiences available on demand in highly individualized ways? One approach to this conflict is the application of the Rich Environments for Active Learning (REAL) model to web-based learning environments.

Rich Environments for Active Learning (REALs)

A model for applying the concepts of constructivism to instructional practice, REALs are comprehensive instructional systems that engage learners in dynamic, authentic learning activities that increase their control and responsibility over the learning process while they learn problem-solving and collaborative skills and content (Dunlap & Grabinger, 1995; Grabinger & Dunlap, 1995; Grabinger, Dunlap, & Duffield, 1997; Kommers, Grabinger, & Dunlap, 1996). The REAL model utilizes the following instructional strategies:

- intentional learning and student responsibility
- authentic contexts and relevant, meaningful learning
- dynamic, generative learning activities
- collaboration and the social negotiation of meaning
- extensive reflection and self-assessment

Encouraging Intentional Learning: Taking Ownership

Intentional learning refers to the cognitive processes that have learning as a goal. Students engaged in intentional learning are purposeful, effortful, self-regulated, and active learners (Palincsar, 1990; Palincsar & Klenk, 1992; Scardamalia & Bereiter, 1985; Scardamalia, Bereiter, McLean, Swallow, & Woodruff, 1989; Scardamalia & Bereiter, 1991; Scardamalia & Bereiter, 1997). Encouraging students to take "an intentional stance toward cognition" helps students learn how to monitor their own thinking and learning processes (i.e., metacognitive skills), and to pursue individually determined learning goals (i.e., self-directed learning). When students take responsibility, or ownership, over their own learning, they develop metacognitive and lifelong learning abilities (Honebein, 1996).

REALs help students manage their own learning by identifying their learning needs, setting learning objectives, selecting and employing learning strategies, using appropriate resources, and assessing their overall process. Research (Scardamalia & Bereiter, 1991) indicates that students can assess what they know and don't know and learn to ask questions to guide their knowledge building, thus assuming a "higher level of agency" and more ownership for their learning. To teach for intentional learning means to cultivate those general abilities that make it possible to become independent, life long learners (Palincsar, 1990).

Authentic Contexts

It is difficult to transfer learning from one situation to another. Learning is more likely to be transferred if instruction is situated within a realistic context (Brown, Collins, & Duguid, 1989). Anchoring learning in larger, more complex contexts helps prevent the acquisition of inert knowledge (Cognition and Technology Group at Vanderbilt, 1993). Because understanding is developed as a natural consequence of interaction with a

complex environment, learning activities should be authentic, reflecting the types of interactions students are likely to face in the "real world" (Honebein, 1996).

Authenticity is an important part of REALs for four reasons. First, realistic problems hold more relevance to students' needs and experiences because they can relate what they are learning to problems and goals that they see every day (Blumenfeld, Soloway, Marx, Krajcik, Guzdial, & Palincsar, 1991; Pintrich, Marx, & Boyle, 1993). Second, authentic situations that reflect the true nature of problems enable students to develop deeper and richer knowledge structures (Albanese & Mitchell, 1993) leading to a higher likelihood of transfer to novel situations. Third, authenticity encourages interaction through collaboration, and negotiation (Johnson & Johnson, 1979; Lowry & Johnson, 1981). Finally, ill-structured, complex problems require a team approach that provides natural opportunities for learners to seek out information, test and refine their ideas, and help each other understand the content.

Dynamic, Generative Learning Activities

Learners are active constructors of knowledge – not just passive receptors of information. Generative learning activities require students – individually and collaboratively – to be responsible for creating, elaborating, and representing domain knowledge in an organized manner (Cognition and Technology Group at Vanderbilt, 1990, 1993; Hannafin, 1992; Scardamalia, Bereiter, McLean, Swallow, & Woodruff, 1989; Scardamalia & Bereiter, 1991). Through generative learning activities, learners take an active role in forming new understandings through the creation of products and solutions to authentic challenges. This process of "generating" knowledge – instead of passively receiving information – helps learners develop transferable knowledge structures, strategies, and the skills for life long learning.

Some generative learning activities provide students with a context or situation requiring them to take action (e.g., a problem that needs to be solved or a case that needs to be analyzed). For example, Schank, Fano, and Jona (1993) describe a generative learning environment in their discussion of the research method of teaching. Under the research method of teaching, students research a particular topic and then present their results to others (e.g., the class, a collaborative group, etc.). In this way, students take over the responsibilities of information gathering, synthesis, and dissemination from the teacher. To be successful, students need to be allowed to select their own topics to research and report on, so that they have a real interest in proceeding with the assignment and have more control over their learning. Because the learning is student-directed, the learning is more meaningful. Bruner (1961) states, "...in general, material that is organized in terms of a person's own interests and cognitive structures is material that has the best chance of being accessible in memory".

Collaboration

Learning takes place in a social context; higher cognitive processes originate from social interactions (Vygotsky, 1978). Lebow (1993, p. 6) states that knowledge acquisition is "firmly embedded in the social and emotional context in which learning takes place". Thus, collaboration, conversation, communication, and establishing a community of learners are critical to the teaching and learning process (Pask, 1975).

REALs demand collaboration among students to achieve complex goals. By employing collaboration strategies, REALs help learners engage in a number of activities that support successful learning:

- *Collective problem solving*. Groups give rise synergistically to insights and solutions that would not come about individually. While working in collaborative groups, learners are more willing to take on the risk required to tackle complex, ill-structured, authentic problems because they have the support of others (Brown et al., 1989; Vygotsky, 1978).
- *Displaying multiple viewpoints*. Students experience and develop an appreciation for multiple perspectives when working with others. They may also play different roles within the group to gain additional insights. Conceptual growth comes from sharing perspectives and testing ideas with others – a negotiating process that modifies internal representations (Bednar, Cunningham, Duffy, & Perry, 1991).
- *Confronting ineffective strategies and misconceptions*. In collaborative work, group members draw out, confront, and discuss both misconceptions and ineffective strategies. Through collaborative participation, students also refine their knowledge through argumentation, structured controversy, and the sharing and testing of ideas and perspectives.

- *Providing collaborative work skills.* Students learn to work together in a give-and-take interaction rather than just dividing the workload. By participating in collaborative learning activities, learners gain an appreciation for the value of cooperation and the individual strengths that members of the team bring to the group.

Reflection and Self-Assessment

Self-reflection activities are embedded into REALs in order to support both the development of knowledge and metacognitive skills. Von Wright (1992) defines metacognitive skills as "the steps that people take to regulate and modify the progress of their cognitive activity: to learn such skills is to acquire procedures that regulate cognitive processes." Glaser (1984) describes this as knowing what one knows and does not know, predicting outcomes, planning ahead, efficiently apportioning time and cognitive resources, and monitoring one's efforts to solve a problem or learn. More specifically, metacognitive skills that are required for life long learning include (Ridley, Schutz, Glanz, & Weinstein, 1992):

- recognition of content and skill limitations;
- setting goals and creating action plans based on those defined limitations;
- activating the appropriate prior knowledge to achieve set goals;
- assessing progress in learning and task performance and effectiveness of learning resources selected;
- awareness of what still needs to be completed to reach a goal, and how best to allocate time and resources; and
- modification of strategies, tactics, processes, and resource selection based on the needs of the task at hand.

Even though reflective activity is important, it is possible for students to be so caught up in completing a task that they fail to reflect, impeding the learning process. "We can keep students so busy that they rarely have time to think about what they are doing, and they may fail to become aware of their methods and options" (Wheatley, 1992, p. 536). Schön (1983) refers to this as being "in the action" rather than reflecting "on the action." If students do not have opportunities to examine their methods and options, they will not develop the metacognitive skills needed for life-long learning. Therefore, learning activities need to support students in reflecting on their own learning and problem-solving processes, as well as on what they have learned (Schön, 1987).

Conclusion

A consistent theme within each of the REAL guidelines is "interaction." Interaction refers to the engagement of learners in the learning process. By engaged learning, we mean that all student activities involve active cognitive processes including creating, problem solving, reasoning, decision making, and evaluation (Kearsley & Shneiderman, 1998). Interactivity involves the learners in options: watching, browsing, finding, doing, using, linking, annotating, constructing, creating, and elaborating (Ambron & Hooper, 1988; Sims, 1997). The use of technology does not diminish the importance of good pedagogy and good pedagogy demands interaction. This is especially true for web-based instruction with the critical need for learner-to-content, learner-to-learner/s, and learner-to-facilitator interaction.

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